STOCK STATUS REPORT NEWFOUNDLAND AND LABRADOR SNOW CRAB

Background

Snow crab, Chionoecetes opilio, occur over a broad depth range in the Northwest Atlantic from Greenland to the Gulf of Maine. In Newfoundland and Labrador there are no known barriers to larval drift or settlement, or other evidence to indicate distinct stocks. The preferred bottom type of adults is mud or mud/sand while juvenile crabs appear to favour gravel or small rocks. The snow crab diet includes clams, polychaete worms, brittle stars and other crustaceans. Predators include seals, cod, thorny skate, and other snow crabs.

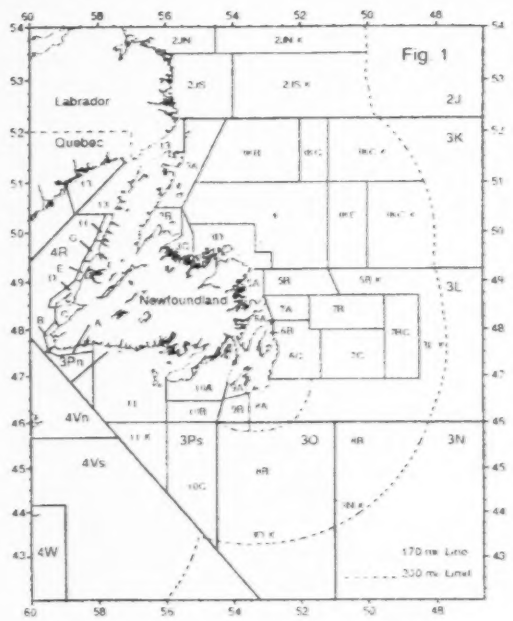
Males continue to molt until they develop large claws, which enhances their ability to compete for mates. This happens during a final molt which may occur over a wide size range, (40-110 mm carapace width, CW). Females cease molting when they mature, at relatively small sizes (40-75 mm CW). It is believed that these crabs live no more than 5-6 years after the final molt.

The minimum legal size in the fishery is 95 mm CW. This regulation excludes females from the fishery while generally ensuring adequate numbers of sexually mature males in the population for reproduction.

The Newfoundland fishery began in Trinity Bay in 1968. Initially, crabs were taken as gillnet by-catch but within several years there was a directed trap fishery in inshore areas along the northeast coast of the Island. Until the early 1980's the fishery was prosecuted by approximately 50 vessels, limited to 800 traps each. In 1981 fishing was restricted to the NAFO Division where the licence holder resided. In the mid 1980's there was a large decline in catches in traditional areas in 3K and 3L while at the same time fisheries started in 2J, 3Ps, 4R and offshore 3K.

Since 1989 there has been a further expansion in the offshore. Fisheries supplemental to the groundfishery started in 3K in 1985, in 3L in 1987 and in both areas of 2J in the early 1990's.

In the late 1980's quota control was initiated in all management areas of each Division and fishing seasons for both fleet sectors were redefined. A dockside monitoring program designed and managed by fishers to enforce daily and weekly quotas was initiated in 3K in 1994 and expanded to include 2J, 3L and 3Ps in 1995. Temporary permits for small vessels (<35 ft) were introduced in 1995 all around the Island. There are now four fleet sectors: fulltime; supplementary >40 gross tons; supplementary <40 gross tons; and temporary, <35 ft vessels restricted to nearshore areas. All sectors have designated trap limits, quotas and fishing areas. With the introduction of additional temporary/seasonal permits in 1996 over 2600 enterprises were eligible to participate in the fishery. Individual quotas were introduced to the fulltime fleet in 3K in 1995 and expanded to almost all fleet sectors and management areas in 1996. Management areas (Fig. 1) do not reflect stock structure. Rather, they were established as a mechanism to control the distribution of fishing effort and prevent local over-exploitation.



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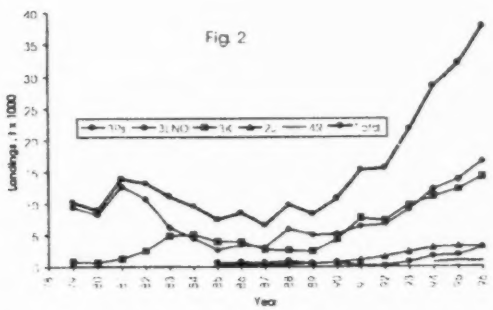
The Fishery

Landings have been increasing steadily since the late 1980's and reached a record high of 37,816 t in 1996, more than double the historical peak in 1981 (Fig. 2). The bulk of the increased landings came from Div. 3K and 3L and largely from expansion of the fishery to offshore areas. Effort, as indicated by estimated trap hauls, has approximately doubled since the late 1980's. Recent catch rate patterns have been quite variable among management areas, but generally levels have remained high. In 1996 several developments in the fishery have compromised direct year-to-year comparison of catch rates as an index of relative abundance. The initiation of a two-tiered pricing system encouraged fishers to discard legal-sized crabs between 95 mm and 103 mm CW. The implications of this high grading, as well as delayed opening of the fishery, to catch rates over the short-term are yet unclear.



Div. 2J: Due to quota reductions landings declined slightly to 3090t in 1996, down from 3,178 t in 1995 (Table 1); effort declined as well from 1995 levels (by ~25%). The overall catch rate had been declining from a high in 1991 of 14.6 kg/trap haul to 7.9 kg/trap haul in 1995. Both management areas were expanded in 1995 (northward in 2JN and eastward in 2JS) to provide opportunity to maintain catch rates by accessing new grounds. This expansion continued offshore (eastward) in 1996 with the discovery of new fishing grounds. CPUE increased to 10.2 kg/trap haul in 1996 as a result of this exploitation of virgin grounds.

Div. 3K: Landings increased to 14,190 t in 1996 from 12,245 in 1995 (Table 1). The overall catch rate has ranged from 12 to 15 kg/trap in the last several years. Catch rates remained high or increased with the exception of 3C and 3D, where CPUE has declined.

Div. 3LNO: Landings, 90% from Div. 3L, totalled 16,656 t in 1996, up from 13,790 t in 1995 (Table 1). The overall catch rate had been increasing steadily from 7.8 kg/trap haul in 1990 to 15-17 kg/trap haul in the last several years. However, catch rates declined in some inshore areas, particularly Bonavista, Trinity and St. Mary's Bays. Many fishers reported using larger-meshed traps in 1996 than in 1995.

Div. 3P: Landings increased to 3047 t in 1996, up from 1,853 t in 1995 (Table 1). The overall catch rate increased to 16.6 kg/trap from 10.0 kg/trap haul in 1995. Catch rates remained high in areas 10 (at more than 3 times the 1990 and 1991 values) and in 10C and increased almost 3-fold in area 11. An unregulated fishery developed adjacent to area 10A in 1996. This fishery, prosecuted by vessels from St. Pierre and Miquelon, landed 166 t.

Div. 4R: Development of the west coast crab fishery continued in 1996 with additional temporary/seasonal permits issued. 1996 landings overall were 833 t, down from 920 t in 1995. CPUE remained the same at 5.9 kg/trap haul.

Table 1. Landings (t) and commercial catch rate (kg/trap haul) by NAFO Division, 1990-96.

Div.	1990	1991	1992	1993	1994	1995	1996
2J	645	989	1,529	2,275	2,978	3,178	3,090
	(12.8)	(14.6)	(12.5)	(12.9)	(9.6)	(7.9)	(10.2)
3K	4,253	7,675	7,295	9,760	11,039	12,245	14,190
	(10.7)	(12.4)	(12.0)	(14.5)	(13.4)	(11.5)	(12.2)
3LNO	5,211	6,394	6,652	8,979	12,237	13,790	16,656
	(7.8)	(8.6)	(12.7)	(14.3)	(15.7)	(17.0)	(15.0)
3Ps	596	176	121	704	1,590	1,853	3,047
	(4.8)	(4.5)	(9.4)	(10.6)	(15.2)	(10.0)	(16.6)
4R	-	-	-	-	655	920	833
					(5.5)	(5.9)	(5.9)

Research Surveys

Research surveys using commercial and small-meshed traps have been carried out in three crab management areas in Div. 3L since the early 1980's. Similar surveys were carried out in Div. 3K (White Bay) in 1994-96. A model was developed for each Div. 3L survey area which uses the survey catch rate of legal-sized (including soft) crabs to provide an indication of

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commercial catch rate in the following year. Yearly trends in survey catch rate of sub-legal sized males from small-meshed traps are also monitored as an index of future recruitment. Crabs of 76-94 mm CW (Prerecruit 1 group) which have small claws will continue to molt and could begin recruiting to the fishery, as hard-shelled crabs, in two years. Smaller crabs of 60-75 mm CW (Prerecruit 2 group) which have small claws could begin recruiting in three years. Data on claw type were available only since 1988.

With the introduction of a new survey trawl, data were available from 1995 and 1996 fall bottom trawl surveys. The Campelen 1800 survey trawl collected crabs across most of the population's size range in both years (Fig. 3).

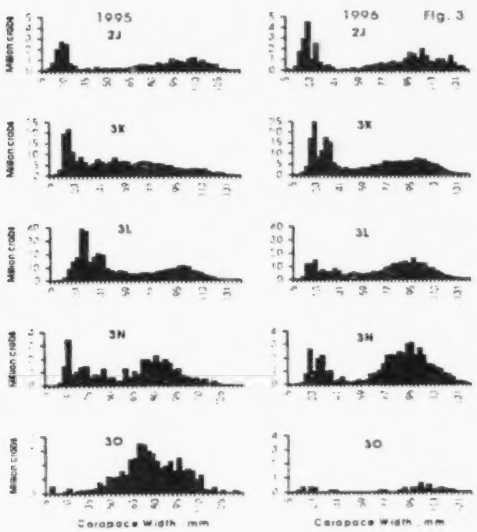
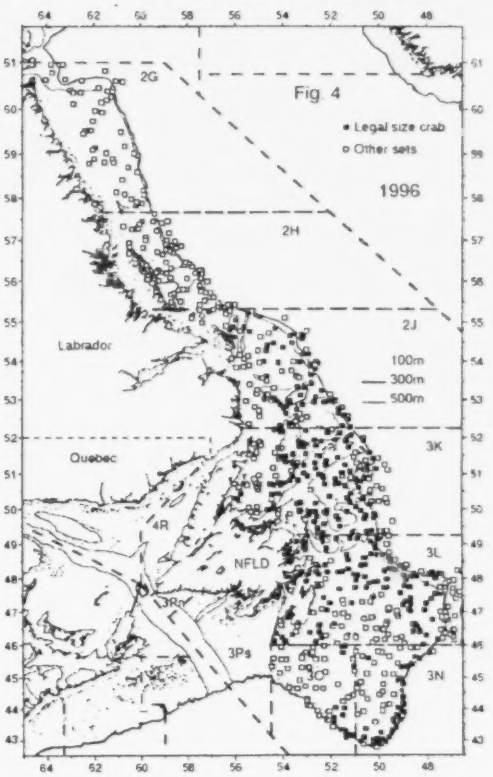


Fig. 3

Stratified random surveys were conducted after the fishery so results were directly applicable to the following season. They sampled an extensive area of snow crab distribution throughout offshore 2J3KLNO in both years. However the survey was more extensive in 1996, including some sets in Div. 2GH and inshore strata. The extensive 1996 survey showed that legal-sized males were broadly distributed throughout much of the survey area (Fig.4). They were strikingly absent north of Div. 2J, on the deep slope of the continental shelf, and across most of the shallow southern Grand Bank. All crab sizes were found together offshore, whereas largest males tended to be concentrated in deepest areas inshore.



Resource Status

Overall, commercial catch rates in 1996 remained high, as had been predicted by the abundance of legal-sized crabs in the Div. 3L 1995 trap surveys. Abundance of legal-sized crabs in the 1996 trap surveys (Fig. 5) remained high for Conception Bay and Northeast Avalon, indicating that commercial catch rates should continue to be high in those areas in 1997. A decline is projected for Bonavista Bay, but the magnitude of this decline is uncertain. Trap surveys are spatially restricted relative to the fall bottom trawl surveys and so may reflect local effects, including exploitation. Trap survey catch rates of legal-sized males for White Bay in 1996 were generally similar to those of the previous two years, consistent with a stable commercial catch rate.

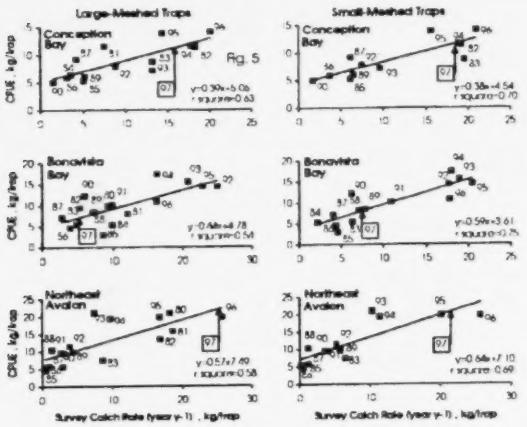


Fig. 5

Data from 1995 and 1996 fall bottom trawl surveys, for same areas, indicate a substantial biomass of legal-sized (including soft-shelled) crabs for all Divisions except Div. 3O (Table 2). Biomass estimates of Prerecruit 1 crabs increased in all divisions except 3O (Table 3). Estimates of the Prerecruit 2 size group decreased for all divisions except 3L (Table 4).

Table 2. Legal-sized crab minimum trawlable biomass estimates, with 95% confidence limits, by NAFO Division for 1995 and 1996.

Year	2J	3K	3L	3N	3O
1995	**4267**	**12692**	**27457**	**2222**	**4494**
	(2688)	(9650)	(18840)	(888)	(-925)
	(5866)	(15733)	(36073)	(3557)	(9913)
1996	**8023**	**24611**	**36378**	**9056**	**1689**
	(5396)	(20003)	(28302)	(2671)	(-9428)
	(10650)	(29219)	(44454)	(15441)	(12806)

Table 3. Prerecruit 1 crab (76-94 mm CW) minimum trawlable biomass estimates, with 95% confidence limits, by NAFO Division for 1995 and 1996.

Year	2J	3K	3L	3N	3O
1995	**978**	**7069**	**11169**	**2584**	**2986**
	(659)	(5309)	(8047)	(-12055)	(645)
	(1297)	(8828)	(14291)	(17224)	(5327)
1996	**1191**	**7868**	**19278**	**3892**	**261**
	(547)	(6125)	(11350)	(-988)	(-61)
	(1835)	(9612)	(27206)	(8772)	(584)

Table 4. Prerecruit 2 crab (60-75 mm CW) minimum trawlable biomass estimates, with 95% confidence limits, by NAFO Division for 1995 and 1996.

Year	2J	3K	3L	3N	3O
1995	**2324**	**3566**	**2999**	**782**	**1745**
	(1231)	(2444)	(2078)	(-339)	(-275)
	(3417)	(4688)	(3920)	(1952)	(3766)
1996	**188**	**2419**	**4361**	**546**	**70**
	(75)	(1665)	(741)	(30)	(-17)
	(301)	(3173)	(7981)	(1063)	(157)

However, trap survey catch rates of Prerecruits with small claws declined to very low levels in Conception Bay and Bonavista Bay. Interpretation of differences in abundance indices of prerecruits between trap and trawl surveys remains uncertain due to differences in gear efficiencies as well as differences in population structure and levels of exploitation between the inshore and offshore areas. Trap catchability is probably more variable than trawl catchability and traps are relatively inefficient in sampling small-clawed crabs.

No survey data were available for Div. 3Ps and 4R but increasing and stable commercial CPUE's respectively suggest sustained resource levels for those areas.

Outlook

Fall bottom trawl data indicate a substantial exploitable biomass for 1997 throughout offshore Div. 2J3KLN. Inshore trap surveys also generally indicate that the fishery should continue to perform well in 1997, but area-specific inshore declines are suggested, as also indicated by recent fishery performance. Such declines are likely due to local variation in recruitment and exploitation levels.

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Research Documents:

Dawe, E.G., D.M. Taylor, P.J. Veitch, H.J. Drew, P.C. Beck, and P.G. O'Keefe. 1997. The status of Newfoundland and Labrador snow crab in 1996. CSAS Res. Doc. 97/7.

Taylor, D.M., and P.G. O'Keefe. 1997a. Summary of performance of the 1996 Newfoundland and Labrador snow crab fishery. CSAS Res. Doc. 97/8.

Taylor, D. M., and P. G. O'Keefe. 1997b. Results of 1996 3L inshore/nearshore snow crab time-series cruises. CSAS Res. Doc. 97/9.

This report is available:

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